



ORAL POLIO VACCINE AND HIV/AIDS: QUESTIONS AND ANSWERS

In the early 1990's an article in Rolling Stone magazine introduced the idea that an experimental oral polio vaccine used in the late 1950's may have caused the AIDS epidemic. In 1999 the idea was presented again in Edward Hooper's book 'The River'. In response to these publications, research has been done to test the validity of the oral polio vaccine/HIV theory. Evidence about the genetic origin and characteristics of HIV, the production of the experimental oral polio vaccine, and the lack of HIV/AIDS epidemics in some areas where the experimental oral polio vaccine was given all suggest that the experimental vaccine was not the source of HIV and AIDS in people. Furthermore, some of the remaining experimental vaccine was recently tested and did not contain HIV or HIV-like viruses. In conclusion, most experts and scientists believe that it is very unlikely that the experimental oral polio vaccine caused the HIV/AIDS epidemic.

What is HIV and how does it spread?

HIV, or human immunodeficiency virus, is the virus that causes AIDS. This virus is passed from one person to another primarily through blood-to-blood and sexual contact. In addition, infected pregnant women can pass HIV to their baby during pregnancy or delivery, as well as through breast-feeding. People with HIV have what is called HIV infection. Most of these people will develop AIDS as a result of their HIV infection. There are two types of HIV that can cause AIDS, HIV-1 and HIV-2. Unlike HIV-1, only a few cases of HIV-2 have been found in the U.S. HIV-2 is mostly an infection of persons from West Africa. When we talk about HIV we mean both HIV-1 and HIV-2.

What is AIDS?

AIDS, or acquired immunodeficiency syndrome, results when HIV weakens the immune system to the point it has difficulty fighting off infections (normally, your immune system helps you fight off illness). AIDS is diagnosed using certain clinical criteria, such as AIDS indicator illnesses or certain blood tests. However, a positive HIV test result does not mean that a person has AIDS. For more information on HIV and AIDS see www.cdc.gov/hiv/dhap.htm

What is Polio?

Poliomyelitis, or Polio, is caused by a virus that lives in the throat and intestinal tract. It is spread through contact with the bowel movements of an infected person (for example, by changing diapers). Polio can cause cold-like symptoms, pain and stiffness in the neck, back, and legs, and, in the worst cases, paralysis or death. Polio was one of the most dreaded childhood diseases of the first half of the 20th Century in the United States. Polio vaccine became available in 1955 and with vaccination the disease has disappeared from the U.S., and efforts are underway to eliminate polio from the rest of the world as well. It would only take one case of polio from another country to bring the disease back if we were not protected through vaccination.

What is polio vaccine and is it safe?

There are two types of polio vaccine: Inactivated (killed) polio vaccine (IPV), which is given as a shot; and live (attenuated or weakened) oral polio vaccine (OPV), which is a liquid that is swallowed. Currently in the U.S. we use only IPV, but in parts of the world where polio still exists people get vaccinated with OPV. Both OPV and IPV give immunity to polio, but OPV is better at keeping the disease from spreading to other people. However, in rare cases (about 1 in 2.4 million), OPV actually causes polio. Since the risk of getting polio in the U.S. is now extremely small, experts believe that OPV is no longer worth the slight risk. IPV does not cause polio or any other serious problems. Some people who get IPV get a sore spot where the shot was given, but most don't have any problems at all with it.

How is polio vaccine made?

IPV is made with dead polio virus. The virus is grown in a lab on a type of monkey kidney cell culture and then killed with formaldehyde or other chemical(s) harmful to the virus. The chemicals are removed before the dead virus is added to the vaccine. OPV is made with live polio virus that has been weakened so that it does not have enough strength left to cause disease. Polio virus that is used to make OPV is also grown in a lab on monkey kidney cell culture and then weakened using chemicals, freezing and dilution before being given to people as a vaccine.

When were polio vaccines first developed and tested?

The first polio vaccines were developed and tested in the 1950's. Jonas Salk introduced the first widely used vaccine in 1954, which was given to people as a shot (IPV). A short time later Salk's shot was replaced by an oral polio vaccine (OPV) developed by Albert Sabin (this vaccine was placed on a sugarcube and eaten). In 1957 another scientist, Dr. Hilary Koprowski, began vaccinating people with an experimental oral polio vaccine (OPV) that was simply dropped into the recipient's mouth and swallowed.

Were animals used in developing and testing polio vaccines?

Testing on animals, especially animals that are closely related to humans such as monkeys and chimpanzees, gave researchers a good idea about the safety and efficacy of their vaccine before giving the vaccine to people. Early polio vaccine tests were done with rabbits, mice, guinea pigs, chimpanzees and monkeys. Also, animal organs were used to grow the polio virus that was killed or weakened to make the vaccines. Monkeys were the most common animal used to grow the polio virus for early vaccines.

Is it true that HIV originally came from monkeys and apes?

Scientists think that HIV-1 evolved from an immunodeficiency virus found in chimpanzees (simian immunodeficiency virus, or SIVcpz). Viruses that infect one species of animal, such as

chimpanzees, generally don't infect other species of animals, such as humans. Therefore, scientists do not know exactly how or why this particular virus 'jumped' from chimpanzees to people—also known as 'cross-species transmission'. Scientists do believe, however, that SIVcpz evolved into HIV-1 many decades ago. DNA and genetic test results of HIV-1 indicate that it may have crossed into humans in the 1930's (Korber et al. 2000, Hahn et al. 2000). HIV-2 is believed to have come from a cross-species transmission of an SIV from a sooty mangabey monkey (SIVsm) (Hahn et al. 2000).

How did HIV 'jump' from primates to people?

People have long hunted monkeys and apes for food and it is believed that some people may have been exposed to or infected with SIV or HIV through contact with blood while hunting and preparing the meat. Hunters could have spread HIV to others through sexual contact or contact with contaminated blood such as occurs with tribal rituals or the use of nonsterilized needles for injections and vaccinations.

If people have hunted chimpanzees for so many years, why weren't there any large-scale outbreaks before the 1960's?

Most likely there were AIDS cases much earlier than the first recorded cases in the early 1960's, but because people did not yet know much about the disease it may not have been recognized as AIDS. Furthermore, changes in society in the 1950's and 1960's, such as urbanization, the breakdown of traditional family life, new attitudes about sexuality and improved transportation, could have accelerated the spread of HIV and AIDS.

Is it possible that the monkey organs used to grow polio virus to make vaccines could have contaminated the vaccine and introduced or helped spread HIV through people that were vaccinated?

A 1992 article in Rolling Stone magazine and the 1999 book "The River" both presented the idea that Dr. Koprowski's experimental oral polio vaccine given to people in the late 1950's caused the introduction ('jump') and spread of HIV-1 in people. There has been a lot of research, debate and discussion concerning this idea, and experts have concluded that the oral polio vaccine did not cause the jump or spread of HIV-1. As mentioned previously, research suggests that HIV-1 formed in the 1930's and Dr. Koprowski's vaccine was developed and used in the late 1950's. So by the time Koprowski's vaccine was used SIVcpz had already evolved into HIV-1. In addition, tests on the last remaining samples of Dr. Koprowski's OPV found no evidence that it was grown with kidney cell culture from chimpanzees, only macaque monkeys (Cohen 2000, Cohen 2001, Horton 2000, Weiss 2001, Rizzo et al. 2001). These monkeys do not carry the virus that is related to HIV and therefore could not have infected the vaccine with HIV. Furthermore, it is very difficult to transmit HIV by ingesting it, especially ingesting such small amounts (the vaccine was only a couple of drops of liquid). It is very unlikely that HIV would be passed from a vaccine given by mouth.

What is the explanation for the fact that the areas where the Koprowski oral polio vaccine was given were close in proximity to the areas where the first AIDS outbreaks were seen?

The areas where Koprowski's vaccine was used and where the first AIDS outbreaks occurred are also areas where chimpanzees that carry SIV live. So it makes sense that those areas were the same areas where SIV 'jumped' from chimpanzees to people, and HIV-1 and AIDS were first seen. Though some people believe that Dr. Koprowski did use chimpanzee organs to grow the virus for the vaccine, evidence indicates that chimpanzees were only used to test the vaccine, not to produce it.

Did early cases of HIV appear everywhere that the Koprowski oral polio vaccine was given?

No. In addition to Africa, Dr. Koprowski's vaccine was given to people in the European countries of Poland, Switzerland, and Croatia. Early cases of AIDS were seen only in Africa. If the vaccine had been contaminated with HIV or a similar virus, it is likely that at least some of the people that were vaccinated in the European countries would have contracted the virus as well.

Was Dr. Koprowski's oral polio vaccine tested for HIV?

The vaccine was not tested for HIV because no one knew about the virus in the 1950's. Tests for HIV and related viruses did not become available until the 1980's. However, some of Dr. Koprowski's vaccine that had been stored in a lab was recently tested and did not contain any HIV or HIV-like viruses. Furthermore, the vaccine tests did not show any evidence of chimpanzee cells, which means that chimpanzee organs were not used to grow the virus for the vaccine and the vaccine, therefore, was not contaminated with SIV, the HIV-like virus. (Cohen 2000, Cohen 2001, Horton 2000, Rizzo et al. 2001, Weiss 2001).

Is Dr. Koprowski's oral polio vaccine related to the polio vaccines now being used worldwide?

Dr. Koprowski's vaccine was only given to people from 1957-1959. The current oral polio vaccine was developed by Dr. Albert Sabin and is not related to Dr. Koprowski's vaccine. Today all vaccines are constantly monitored and tested by the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), the National Institutes of Health (NIH), and other Federal agencies.

Is it possible to get HIV from vaccines that are used today?

No--All vaccines used today have to go through testing and evaluation before and after they are licensed for use. This begins with extensive testing in labs and animals, followed by three phases of testing on groups of human volunteers. In addition, tissues and cells used to grow and produce

any biological item, such as vaccines, are required to be tested and cleared of any viruses, including HIV (FDA 1993). If a vaccine passes all of these rigorous scientific tests it may be approved by the Food and Drug Administration (FDA) and licensed for use. The FDA and CDC continue to monitor a vaccine, even after it is tested and licensed, to make sure that it continues to be safe (see www.fda.gov/cber/vaccines.htm for more information). The Vaccine Adverse Event Reporting System, or VAERS, was designed to give health care workers and others a place to report negative reactions following vaccination. VAERS helps the FDA and CDC to continuously monitor vaccine safety. To request a VAERS form or to get more information about VAERS, please call 1-800-822-7967.

REFERENCES

Cohen J. Disputed AIDS theory dies its final death. *Science* 2001;292:615.

Cohen J. Vaccine theory of AIDS origins disputed at Royal Society. *Science* 2000;289:1850-1851.

FDA. Points to consider in the characterization of cell lines used to produce biologicals. 1993 <http://www.fda.gov/cber/gdlns/ptccell.htm#i>

Hahn B, Shaw G, De Cock K, Sharp P. AIDS as a zoonosis: scientific and public health implications. *Science* 2000;287:607-614.

Horton R. New data challenge OPV theory of AIDS origin. *Lancet* 2000;356:1005.

Korber B, Muldoon M, Theiler J, Gao F, Gupta R, Lapedes A, Hahn BH, Wolinsky S, Bhattacharya T. Timing the ancestor of the HIV-1 pandemic strains. *Science* 2000;288:1789-1796.

Rizzo P, Matker C, Powers A, Setlak P, Heeney JL, Ratner H, Carbone M. No evidence of HIV and SIV sequences in two separate lots of polio vaccines used in the first U.S. polio vaccine campaign. *Virology* 2001;287:13-17.

Weiss R. Polio vaccines exonerated. *Nature* 2001;410:1035-1036.

FOR MORE INFORMATION

Koprowski H. AIDS and the polio vaccine. *Science* 1992;257:1024-1027.

USPHS-CDC News. No AIDS risk from polio vaccines. *Annals of Pharmacotherapy* 1992;26:867.

Wistar Committee Report. Report from the AIDS/poliovirus advisory committee. 1992 <http://helix.ucsd.edu/~bssimon/dissent1/documents/AIDS/Wistar92.html>

